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Subject: Update of Information Previously Provided to the NRC in Support of Request for Exemption from 10 CFR 50, Appendix K, for Boric Acid Precipitation Control Methodology (TAC No. MA7831)

Ladies and Gentlemen:

This letter updates information previously provided to the NRC in support of a request for an exemption from the requirements of Title 10 of the Code of Federal Regulations (CFR), Section 50, Appendix K, "ECCS Evaluation Models," for the Davis-Besse Nuclear Power Station (DBNPS) boric acid precipitation control (BPC) methodology. The FirstEnergy Nuclear Operating Company (FENOC) requested the exemption in a letter dated March 15, 2000 (DBNPS Serial No. 2633), as supplemented by a letter dated April 3, 2003 (Serial No. 2652). The NRC granted the requested exemption on May 5, 2000 (DBNPS Log No. 5659).

As described in DBNPS Updated Safety Analysis Report (USAR) Section 6.3.3.1.2.1, "Boron Precipitation Control," two active means of ensuring that the Reactor Coolant System (RCS) boric acid concentration remains below its solubility limit throughout the post-accident cooling period are provided, a primary method and a backup method. The primary BPC method utilizes High Pressure Injection (HPI) Pump 2, taking suction from the discharge of Decay Heat Removal/Low Pressure Injection (DHR/LPI) Pump 2, to supply water to the auxiliary pressurizer spray line via a tie-line, providing dilution flow to the RCS via the pressurizer. The backup BPC method requires that both trains of LPI be operating. One of the two operating DHR/LPI pumps takes suction from the DHR drop line (via valves DH-11 and DH-12), and discharges a low (throttled) flow rate into the reactor vessel via the core flood nozzles. The flow through the drop line allows

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forward flow through the reactor vessel, so that any amount of flow of relatively low concentration water from the train aligned to the containment emergency sump will enter and dilute the boric acid in the core.

Page 5 of Enclosure 1 of the March 15, 2000 exemption request stated that with the backup BPC method, liquid-to-steam flashing would not occur in any part of the system. The NRC staff-issued exemption, dated May 5, 2000, did not address steam flashing in the system. However, during the ongoing Thirteenth Refueling Outage (13RFO), it was identified that the backup BPC method is susceptible to steam void formation because the DHR drop line piping configuration is such that it rises approximately two feet above the centerline elevation of the RCS hot leg. Therefore, if the RCS fluid entering the DHR drop line was at saturated conditions, the fluid would flash to steam when it reaches the higher portion of the piping due to the loss of elevation head. This could result in pressure fluctuations in the piping and potentially interrupt flow if the voids collect in the piping high point.

A calculation was completed to evaluate the effects of steam void formation on the backup BPC method. This calculation demonstrated that the steam voiding phenomenon could occur in the piping. However, the calculation showed that as the steam void grows and fills the piping, it eventually reaches the DHR/LPI pump minimum flow recirculation injection location. At this point, the cold water from the injection point collapses the steam and thereby draws additional liquid over the high point, refilling the pump suction line. With the system oscillating in this mode, the pump suction stays continuously flooded with liquid, such that the pump will continue to pump liquid. This maintains the minimum recirculation flow and allows the BPC function to be fulfilled. A separate calculation was completed to evaluate the potential for water hammer due to the collapsing steam voids. The evaluation determined that significant water hammer would not occur in the system.

Because analysis of a system under transient conditions is challenging, a physical model was constructed to study the backup BPC configuration in a test loop. The model was scaled to preserve the flow velocity in the horizontal section of the pipe and to maintain the same ratio of main flow to recirculation flow. Fluid temperatures and pressures in the test loop matched the expected system fluid conditions for the BPC mode of operation. The test loop results confirmed the calculation results. Steam accumulated in the piping high point as well as in the downcomer piping from the high point to the horizontal pipe section containing the cold water injection port. However, when the steam progressed close to the region of cold water injection, condensation occurred, which decreased the pressure in the downcomer piping, thereby lifting water up and through the piping high point. It is also notable that during operation of the test loop, no water hammer events were either audible or measured.

Based on the analyses and experimental results, it is concluded that the backup BPC method will still function even with the presence of steam voiding in the system. Therefore, the bases of the exemption remain valid. No response to this letter is requested or required. However, should you have any questions or require additional information, please contact Mr. Kevin L. Ostrowski, Manager - Regulatory Affairs, at (419) 321-8450.

Very truly yours,

MKL

Enclosure

cc: Regional Administrator, NRC Region III
J. B. Hopkins, NRC/NRR Senior Project Manager
C. S. Thomas, NRC Region III, DB-1 Senior Resident Inspector
Utility Radiological Safety Board

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COMMITMENT LIST

THE FOLLOWING LIST IDENTIFIES THOSE ACTIONS COMMITTED TO BY THE DAVIS-BESSE NUCLEAR POWER STATION (DBNPS) IN THIS DOCUMENT. ANY OTHER ACTIONS DISCUSSED IN THE SUBMITTAL REPRESENT INTENDED OR PLANNED ACTIONS BY THE DBNPS. THEY ARE DESCRIBED ONLY FOR INFORMATION AND ARE NOT REGULATORY COMMITMENTS. PLEASE NOTIFY THE MANAGER – REGULATORY AFFAIRS (419-321-8450) AT THE DBNPS OF ANY QUESTIONS REGARDING THIS DOCUMENT OR ANY ASSOCIATED REGULATORY COMMITMENTS.

COMMITMENTS	DUE DATE
None.	N/A